CLAIMS:

1.   A process for sensing a change in molecular structural shape of a molecule attached to the surface of a transverse shear piezoelectric sensing device driven by a network analyser, said process comprising:

    i)   exciting said sensing device at a series of predetermined frequencies;

    ii)   measuring electrical impedance of the sensing device at the predetermined frequencies by determining the overall parameters of series resonant frequency (Fs), motional resistance (Rm), motional inductance (Lm), motional capacitance (Cm) and static capacitance (Co); and

    iii)   determining relative changes in electrical impedence over said series of predetermined frequencies indicative of a change in molecular structural shape of a molecule attached to the surface.

2.   The process according to claim 1 wherein the step of determining relative changes in electrical impedence comprises the steps of:

    a)   determining the boundary layer slip parameter (α) from the overall parameters;

    b)   determining relative changes in the boundary layer slip parameter (α) to detect changes in energy coupling indicative of changes in the molecular structural shape of a molecule attached to the surface; and

    c)   correlating said changes in α with a calibrated set of data to determine the molecular structural shape of a molecule attached to the surface.

3.   The process according to claim 1 or 2 wherein a change in the boundary layer slip parameter (α) and an essentially zero change in the series resonant frequency (Fs) indicates a change in the molecular structural shape of a molecule attached to the surface and essentially zero change in mass.

4.   The process according to claims 1 and 2 wherein changes in molecular structural shape are generated by an interaction between a molecule attached to the surface of the sensing device and an entity in a surrounding liquid medium.

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5.   The process according to claim 4 wherein said molecule is selected from the group consisting of proteins and nucleic acids.

5   6.   The process according to claim 5 wherein said proteins are selected from the group consisting of antibodies, enzymes, molecular receptors, receptor ligands and polypeptides.

7.   The process according to claim 5 wherein said nucleic acids are selected from the
10   group consisting of DNA, RNA and oligonucleotides.

8.   The process according to claim 4 wherein said entities in said surrounding liquid medium are selected from the group consisting of proteins and nucleic acids.

15   9.   The process according to claim 8 wherein said proteins are selected from the group consisting of antibodies, enzymes, molecular receptors, receptor ligands and polypeptides.

10.   The process according to claim 8 wherein said nucleic acids are selected from the
20   group consisting of DNA, RNA and oligonucleotides.

11.   A process for detecting a change in conformation of a molecule attached to the surface of a transverse shear piezoelectric sensor, said change in conformation being imposed by interaction of said molecule with an entity in a fluid; said
25   process comprising the steps of:

a)   contacting the molecule with a fluid suspected to contain an entity capable of changing the conformation of the molecule;

b)   exciting the sensor at a series of predetermined frequencies;

c)   measuring electrical impedance of the sensor at the predetermined
30   frequencies by determining the overall parameters of series resonant frequency (Fs), motional resistance (Rm), motional inductance (Lm), motional capacitance (Cm) and static capacitance (Co);

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d)   determining the boundary layer slip parameter (α) from the electrical impedance determined from the overall parameters;

e)   determining relative changes in the boundary layer slip parameter (α) to detect changes in energy coupling indicative of a change in the conformation of the molecule;

f)   correlating changes in the boundary layer slip parameter (α) with data obtained using calibrated quantities of the entity in the fluid; and

g)   determining a change in conformation of the molecule attributable to interaction with the entity in the fluid.

12.   The process of claim 11 wherein a change in the conformation of a molecule comprises a change in mass or a change in shape.

13.   The process of claim 11 wherein said fluid flows through a chamber to contact the molecule bound to the sensor, and wherein step f) comprises correlating the boundary layer slip parameter (α) for:

(i)   a baseline value of α for fluid without said entity; and

(ii)   a test value of α for fluid containing said entity.

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